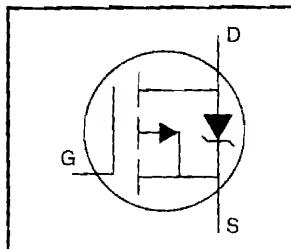


## HEXFET® Power MOSFET

- Dynamic dv/dt Rating
- Repetitive Avalanche Rated
- P-Channel
- 175°C Operating Temperature
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements

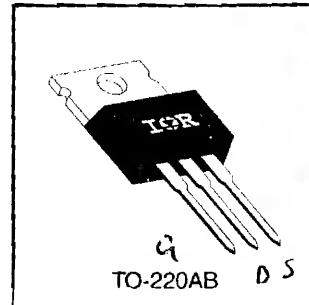


$V_{DSS} = -100V$   
 $R_{DS(on)} = 1.2\Omega$   
 $I_D = -4.0A$

### Description

Third Generation HEXFETs from International Rectifier provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The TO-220 package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 watts. The low thermal resistance and low package cost of the TO-220 contribute to its wide acceptance throughout the industry.



DATA SHEETS

### Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -10 V$	-4.0	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ -10 V$	-2.8	
$I_{DM}$	Pulsed Drain Current ①	-16	
$P_D @ T_C = 25^\circ C$	Power Dissipation	43	W
	Linear Derating Factor	0.29	W/ $^\circ C$
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$E_{AS}$	Single Pulse Avalanche Energy ②	200	mJ
$I_{AR}$	Avalanche Current ①	-4.0	A
$E_{AR}$	Repetitive Avalanche Energy ①	4.3	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$ ③	-5.5	V/ns
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to +175	$^\circ C$
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting Torque, 6-32 or M3 screw	10 lbf•in (1.1 N•m)	

### Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{IJC}$	Junction-to-Case	—	—	3.5	$^\circ C/W$
$R_{ICS}$	Case-to-Sink, Flat, Greased Surface	—	0.50	—	
$R_{IJA}$	Junction-to-Ambient	—	—	62	

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## Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Test Cond.
$V_{(\text{BR})\text{DSS}}$	Drain-to-Source Breakdown Voltage	-100	—	—	V	$V_{GS}=0\text{V}, I_D=-250\mu\text{A}$
$\Delta V_{(\text{BR})\text{DSS}/\Delta T_J}$	Breakdown Voltage Temp. Coefficient	—	-0.091	—	$\text{V}^\circ\text{C}$	Reference to $25^\circ\text{C}$
$R_{\text{DS(on)}}$	Static Drain-to-Source On-Resistance	—	—	1.2	$\Omega$	$V_{GS}=-10\text{V}, I_D=2.4\text{A}$
$V_{GS(\text{th})}$	Gate Threshold Voltage	-2.0	—	-4.0	V	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$
$G_{fs}$	Forward Transconductance	1.0	—	—	S	$V_{DS}=-50\text{V}, I_D=-2.4\text{A}$
$I_{\text{loss}}$	Drain-to-Source Leakage Current	—	—	-100	$\mu\text{A}$	$V_{DS}=-100\text{V}, V_{GS}=0\text{V}$
		—	—	-500		$V_{DS}=-80\text{V}, V_{GS}=0\text{V}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	-100	$\text{nA}$	$V_{GS}=-20\text{V}$
	Gate-to-Source Reverse Leakage	—	—	100		$V_{GS}=20\text{V}$
$Q_g$	Total Gate Charge	—	—	8.7	$\text{nC}$	$I_D=-4.0\text{A}$
$Q_{gs}$	Gate-to-Source Charge	—	—	2.2		$V_{DS}=-80\text{V}$ $V_{DD}=-30\text{V}$
$t_r$	Rise Time	—	27	—		$I_D=-4.0\text{A}$
$t_{d(off)}$	Turn-Off Delay Time	—	15	—		$R_G=24\Omega$
$t_f$	Fall Time	—	17	—	$\text{nH}$	$R_D=11\Omega$ See Figure 10
$L_D$	Internal Drain Inductance	—	4.5	—		Between lead, 6 mm (0.25in.) from package and center of die contact
$L_S$	Internal Source Inductance	—	7.5	—		
$C_{iss}$	Input Capacitance	—	200	—	$\text{pF}$	$V_{GS}=0\text{V}$
$C_{oss}$	Output Capacitance	—	94	—		$V_{DS}=-25\text{V}$
$C_{rss}$	Reverse Transfer Capacitance	—	18	—		$f=1.0\text{MHz}$ See Figure 5

## Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	-4.0	$\text{A}$	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	-16		
$V_{SD}$	Diode Forward Voltage	—	—	-5.5	V	$T_J=25^\circ\text{C}, I_S=-4.0\text{A}, V_{GS}=0\text{V}$
$t_{rr}$	Reverse Recovery Time	—	82	160	ns	$T_J=25^\circ\text{C}, I_F=-4.0\text{A}$
$Q_{rr}$	Reverse Recovery Charge	—	0.15	0.30	$\mu\text{C}$	$dI/dt=100\text{A}/\mu\text{s}$ ④
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_D$ )				

### Notes:

① Repetitive rating; pulse width limited by max. junction temperature (See Figure 11)

③  $I_{SD}\leq-4.0\text{A}$ ,  $di/dt\leq75\text{A}/\mu\text{s}$ ,  $V_{DD}\leq V_{(\text{BR})\text{DSS}}$ ,  $T_J\leq175^\circ\text{C}$

②  $V_{DD}=-25\text{V}$ , starting  $T_J=25^\circ\text{C}$ ,  $L=18\text{mH}$   
 $R_G=25\Omega$ ,  $I_{AS}=-4.0\text{A}$  (See Figure 12)

④ Pulse width  $\leq 300\ \mu\text{s}$ ; duty cycle  $\leq 2\%$ .

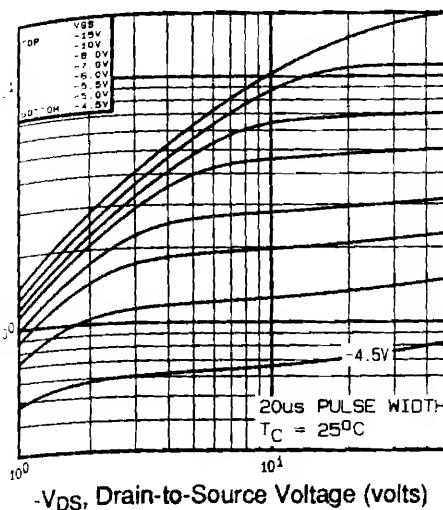


Fig 1. Typical Output Characteristics,  
 $T_c = 25^\circ\text{C}$

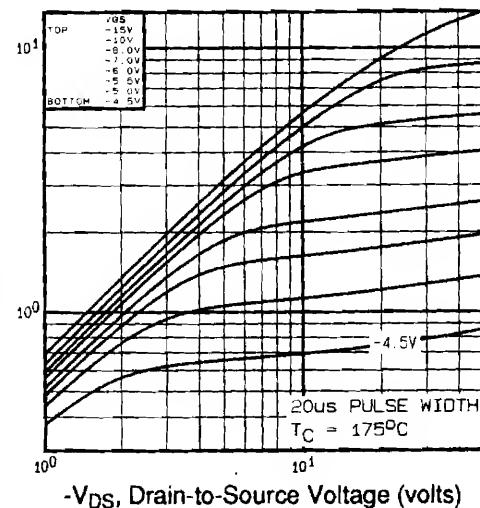


Fig 2. Typical Output Characteristics,  
 $T_c = 175^\circ\text{C}$

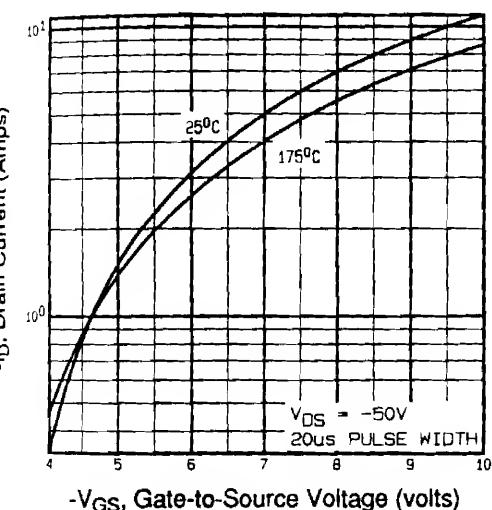


Fig 3. Typical Transfer Characteristics

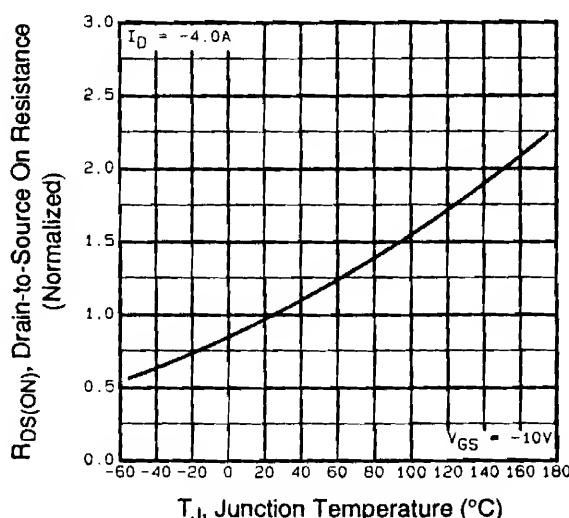
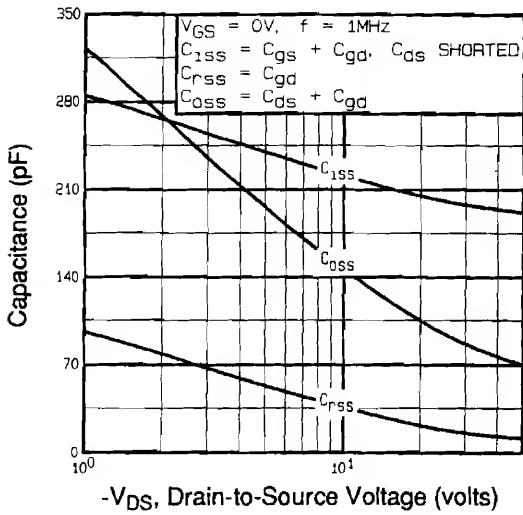
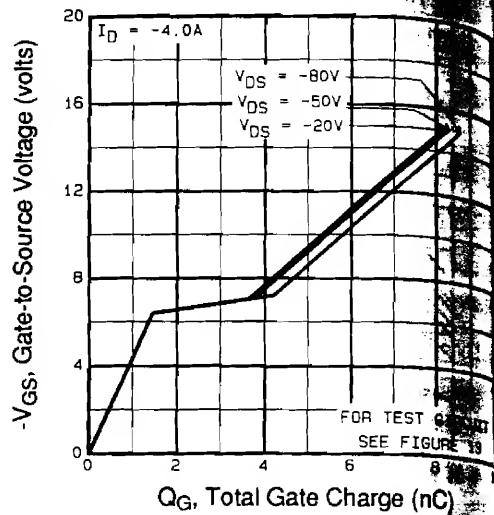


Fig 4. Normalized On-Resistance  
Vs. Temperature

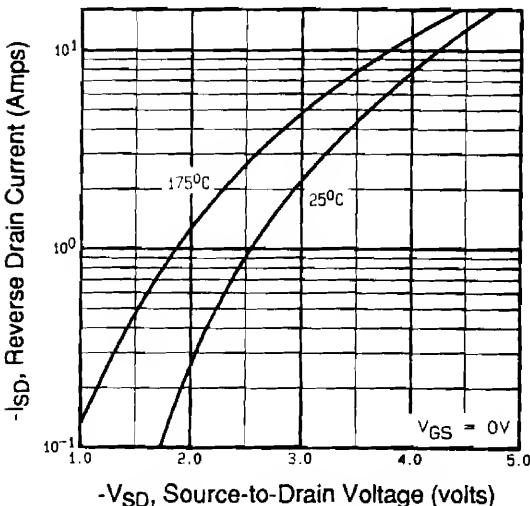
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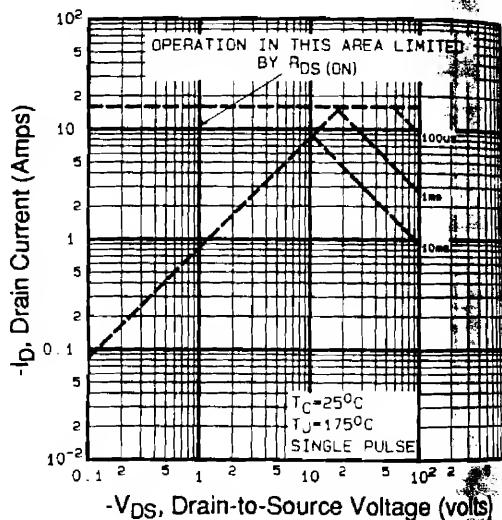
**Fig 5.** Typical Capacitance Vs.  
Drain-to-Source Voltage



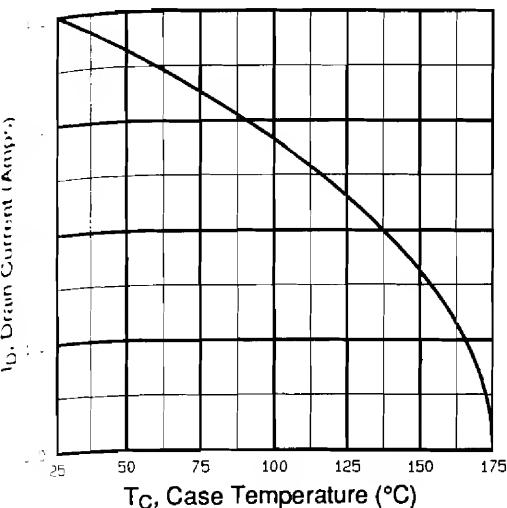
**Fig 6.** Typical Gate Charge Vs.  
Gate-to-Source Voltage



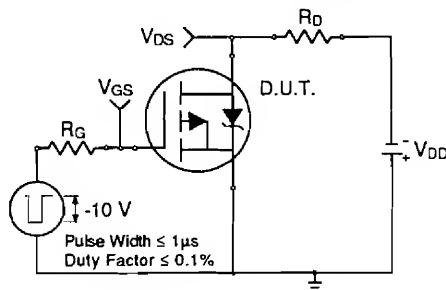
**Fig 7.** Typical Source-Drain Diode  
Forward Voltage



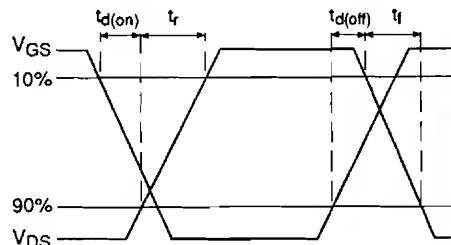
**Fig 8.** Maximum Safe Operating Area



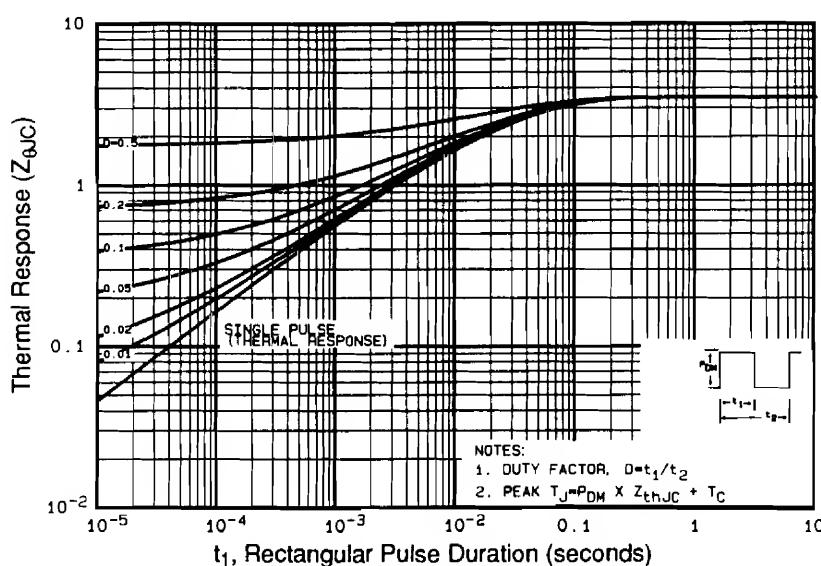
**Fig 9.** Maximum Drain Current Vs.  
Case Temperature



**Fig 10a.** Switching Time Test Circuit



**Fig 10b.** Switching Time Waveforms



**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

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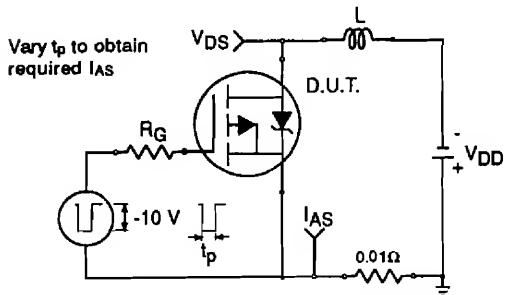


Fig 12a. Unclamped Inductive Test Circuit

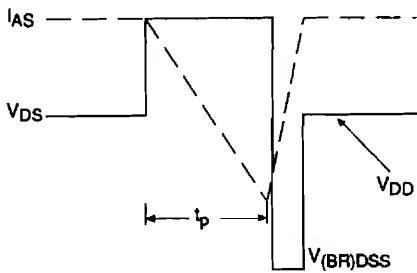


Fig 12b. Unclamped Inductive Waveforms

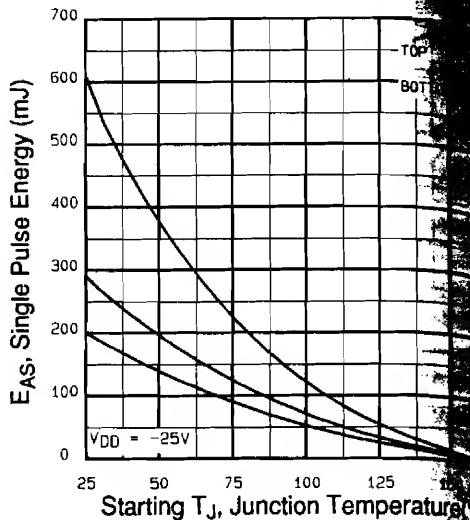


Fig 12c. Maximum Avalanche Energy vs. Drain Current

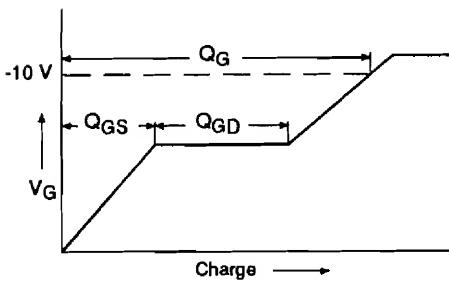


Fig 13a. Basic Gate Charge Waveform

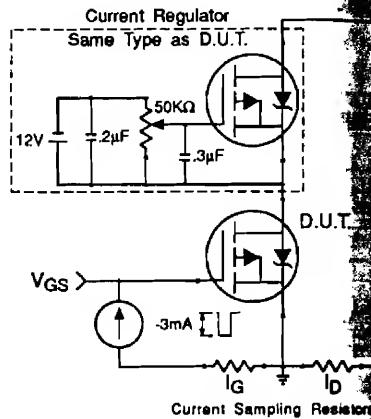


Fig 13b. Gate Charge Test Circuit

Appendix A: Figure 14, Peak Diode Recovery dv/dt Test Circuit – See page 1506

Appendix B: Package Outline Mechanical Drawing – See page 1509

Appendix C: Part Marking Information – See page 1516

Appendix E: Optional Leadforms – See page 1525

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